

Focus . . . Exercise, Employment, Other Daily Activities, and Adverse Pregnancy Outcomes

Historically, pregnant women have been encouraged to reduce physical activity and stop working, especially during the latter stages of pregnancy. Despite possible negative effects, increasing numbers of women are engaging in regular exercise and working throughout pregnancy. What effect this is having on the pregnancy outcomes of these women is not clear.

The present study examines the relations of exercise, employment, and other daily activities with pregnancy outcome using the Missouri Maternal and Infant Health Survey1 (MMIHS). The MMIHS is a population-based case-control study developed to examine factors related to the prevention and subsequent health care needs of very-low-birth-weight infants as well as stillbirths. It is a joint project of the National Institute of Child Health and Human Development and the Missouri Department of Health.

The MMIHS is a study of all Missouri resident very-low- birth-weight (VLBW, <1,500 g) infants born between December 1, 1989, and March 31, 1991, with similar numbers of moderately low-birth-weight (MLBW, 1,500-2,499 g) infants and normal-birth-weight (NBW, >2,500 g) infants serving as control for singletons. The study also covered all Missouri resident fetal deaths (20 weeks gestation or more) for the same time period.

The overall response rate for the maternal survey was 75.6 percent (3,102 of 4,104). Maternal surveys were available for the following singleton birth categories, 450 fetal deaths, 782 VLBW, 802 MLBW, and 794 normal-birth-weight births.

For the exercise question, we asked how frequently the mothers engaged in exercise activities during the 3 months before pregnancy, during each trimester, and during the 3 months after pregnancy. We gave examples of what we meant by vigorous exercise activity (at least 20 minutes at a time) and asked them to check one of four boxes for each time period requested: never, less than once a week, one to two times a week, and three or more times a week. We also asked them to describe the activity they did most often.

Unconditional logistic regression was used to calculate adjusted odds ratios of exercising three or more times per week (exercise) for each trimester between the various outcome groups: VLBW, MLBW, NBW, and fetal deaths. Covariates used in these models included the following variables: mother's perception of general health during pregnancy (4-point scale from excellent to poor), physician advised mother to exercise more or less, age, education level and prepregnancy weight of mother, bed rest prescribed for 24 hours per day, mother smoked during pregnancy, race (black, non-black), and source of survey (hospital or mail).

As seen in Table 1, the exercise frequency percentages changed throughout the pregnancy by outcome (i.e., VLBW, MLBW, NBW and fetal deaths). Before pregnancy, the exercise distributions by outcome were very similar with approximately one third of each group not exercising, slightly less than one third exercising three or more times per week. Slightly less than 60 percent of those who exercised walked while the rest were involved in more vigorous activities such as swimming, doing aerobics, or playing tennis.

As their pregnancies progressed, more women discontinued exercise as the percentage of those exercising three or more times per week decreased to approximately 16 percent for the total study sample in the third trimester whereas only 7 percent of the VLBW mothers exercised three or more times in this trimester. Of those who did exercise, 80 percent of the NBW mothers and 85 percent of the VLBW mothers primarily walked.

In the 3 months immediately after delivery, the no exercise level returned to approximately the first trimester level and the proportion exercising three or more times per week was about the same as in the second trimester. There was little difference between the outcome groups during this period after pregnancy.

Table 2 reflects the decreased exercise crude odds ratio between VLBW and NBW mothers as their pregnancies progressed. From a non-statistically significant ratio of 0.95 (95 percent confidence interval (CI) 0.76-1.18) before pregnancy, the exercise crude odds ratio decreased to 0.71 (95 percent CI 0.55-0.90) in the first trimester, 0.52 (95 percent CI 0.39-0.68) in the second trimester, and 0.32 (95 percent CI 0.20-0.49) in the third trimester. During the 3 months after pregnancy, the ratio returned to a nonsignificant 0.82 (95 percent CI 0.57-1.16).

After adjustment for the confounding variables, the exercise odds ratios changed only slightly, as also shown in Table 2. The ratio in the second trimester was still 0.54 to 1, and the exercise odds ratio was 0.33 to 1 in the third trimester between VLBW and NBW mothers.

The relationship of exercise by trimester between other pregnancy outcomes is shown in Table 3. No significant relation was found between mothers of moderately low-birth- weight infants and those having normal-birth-weight babies. VLBW mothers were significantly less likely to exercise in the first, second, and third trimesters than MLBW mothers; and VLBW mothers were also significantly less likely to exercise in the second or third trimesters than mothers having fetal deaths.

Next we examined other daily activities during pregnancy. There was no relation between working during pregnancy and outcome of pregnancy inasmuch as approximately 60 percent in each group work. There also was no relation between hours worked per week and pregnancy outcome.

No significant associations were found for other daily activities and adverse pregnancy outcome. The activities tested included climbing stairs, standing for 3 or more hours, not being able to rest when tired, carrying loads, and engaging in strenuous household activities. One exception was the VLBW and MLBW mothers were slightly less likely to take care of preschool children during pregnancy than NBW mothers (odds ratios = 0.74 and 0.81, respectively). This is another indication of VLBW mothers being less active during pregnancy than other mothers.

DISCUSSION

The major finding of this study is that mothers of VLBW infants are much less likely to exercise during pregnancy than mothers having other pregnancy outcomes. The exercise odds ratios between VLBW mothers and other mothers decreased significantly in the second or third trimesters. No significantly increased risks were found between employment during pregnancy, types of work activities and conditions, or other daily activities and adverse pregnancy outcome.

Our exercise findings are consistent with the recent relaxation of American College of Obstetricians and Gynecologists guidelines (2) regarding exercise in pregnancy. They are also consistent with the Lokey et al. (3) and Hatch et al. (4) studies that found no association with adverse outcome for low-risk women exercising during pregnancy.

The relations between VLBW and lack of maternal exercise in the second and third trimesters may be due to a number of factors. It may be because the VLBW mothers are in poorer physical health during pregnancy. Medical risk indicators during pregnancy may lead physicians to encourage VLBW mothers to restrict activity. We did, however, control for various questions related to poor maternal health and physician's advice regarding activity, which had little effect on the exercise odds ratios between pregnancy outcomes. A stratification analysis by pregnancy symptoms also did not substantially affect odds ratios.

The relations may represent some artifact in the data. The exercise questions were self-reported and were answered by mothers after their pregnancies, involving possible recall bias for the VLBW mothers in particular. The exercise odds ratios may have been deflated, particularly in the third trimester, because the VLBW mothers had shorter pregnancies and fewer weeks to exercise. The lack of a stronger relationship between exercise and some of the covariates may be an indication of inaccuracy in maternal responses to the survey questions.

It is possible that lack of exercise does contribute to very-low-birth-weight outcomes. To confirm this hypothesis, it would be necessary to do a large prospective study in which pregnant women's exercise programs would be very closely supervised. The conclusion of this Missouri study provides no indication that exercising regularly, working, or doing other normal activities during pregnancy contributes to adverse pregnancy outcomes.

References:

- 1Missouri Monthly Vital Statistics Report. Preliminary Results from VLBW Study. Jefferson City, MO May 1994.
- 2American College of Obstetricians and Gynecologists. Exercise during pregnancy and the postpartum period. Washington, DC: ACOG, 1994.
- 3Lokey EA, Tran ZV, Wells CL, et al. Effects of physical exercise on pregnancy outcomes: a meta-analytic review. *Med Sci Sports Exerc* 1991; 23: 1234-9.
- 4Hatch MC, Shu X, McLean DE, et al. Maternal exercise during pregnancy, physical fitness, and fetal growth. *Am J Epidemiol* 1993; 137: 1105-14.

Table 1

**Percentage of Mothers Exercising Three or More Times per Week by Trimester by Pregnancy Outcome,
Missouri Maternal and Infant Health Survey**

Time of Exercise	Pregnancy Outcome									
	Fetal deaths		VLBW*		MLBW*		NBW*		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
3 months before pregnancy	437	28.4	756	29.6	776	31.6	779	30.8	2,748	30.3
Trimester										
First	438	20.5	754	19.1	775	26.6	774	25.1	2,741	23.1
Second	424	17.2	734	13.1	772	22.9	772	22.5	2,702	19.2
Third	255	15.7	358	7.0	756	18.3	767	19.1	2,136	16.3
3 months after pregnancy	276	23.2	389	16.7	454	20.7	441	19.7	1,560	19.9

*VLBW, very low birth weight (<1,500 g); MLBW, moderately low birth weight (1,500-2,499 g); NBW, normal birth weight ($\geq 2,500$ g).

Table 2

**Odds Ratios for Exercise Three or More Times per Week by Trimester of Pregnancy for Mothers of
Very Low Versus Normal Birth Weight Deliveries, Missouri Maternal and Infant Health Survey**

Time of Exercise	Crude				Adjusted**			
	No. of Births				No. of Births			
	VLBW*	NBW*	OR*	95% ci*	VLBW	NBW	OR	95% ci
3 months before pregnancy	756	779	0.95	0.76-1.18	702	733	0.88	0.69-1.12

Trimester								
First	754	774	0.71	0.55-0.90	698	729	0.70	0.53-0.92
Second	734	772	0.52	0.39-0.68	678	727	0.54	0.40-0.74
Third	358	767	0.32	0.20-0.49	332	722	0.33	0.20-0.53
3 months after pregnancy	389	441	0.82	0.57-1.16	361	412	0.81	0.54-1.22

*VLBW, very low birth weight (<1,500 g); NBW, normal birth weight ($\geq 2,500$ g); OR, odds ratio; CI, confidence interval.

**Covariates used were mother's perception of general health during pregnancy, physician's advice regarding exercise, age, education level, and prepregnancy weight of mother, bed rest prescribed for 24 hours per day, mother's smoking during pregnancy, race, and source of survey (hospital or mail).

Table 3

Adjusted* Odds Ratios for Exercise Three or More Times per Week by Trimester of Pregnancy and Pregnancy Outcome, Missouri Maternal and Infant Health Survey

Time of exercise	<i>MLBW** vs. NBW**</i>				<i>VLBW** vs. MLBW</i>				<i>VLBW** vs. Fetal Death</i>			
	<i>No. of Births</i>				<i>No. of Births</i>				<i>No. of Births</i>			
	<i>MLBW</i>	<i>NBW</i>	<i>OR**</i>	<i>95% CI</i>	<i>MLBW</i>	<i>OR</i>	<i>95% CI</i>	<i>MLBW</i>	<i>MLBW</i>	<i>OR</i>	<i>95% CI</i>	
3 months before pregnancy	733	733	1.08	0.85-1.36	702	733	0.88	0.70-1.11	702	393	0.93	0.70-1.24
Trimester												
First	733	729	1.16	0.91-1.48	698	729	0.67	0.51-0.86	698	395	0.80	0.58-1.10
Second	730	727	1.07	0.83-1.39	678	727	0.49	0.36-0.65	678	385	0.68	0.47-0.98
Third	716	722	1.00	0.76-1.32	332	722	0.34	0.21-0.54	332	230	0.36	0.19-0.67
3 months after pregnancy	427	412	1.14	0.84-1.62	361	412	0.75	0.52-1.10	361	251	0.60	0.38-0.94

*Covariates used were mother's perception of general health during pregnancy, physician's advice regarding exercise, age, education level, and prepregnancy weight of mother, bed rest prescribed for 24 hours per day, mother's smoking during pregnancy, race, and source of survey (hospital or mail).

**MLBW, moderately low birth weight (1,500-2,499 g); NBW, normal birth weight ($\geq 2,500$ g); VLBW, very low birth weight (<1,500 g); OR, odds ratio; CI, confidence interval.

Provisional Vital Statistics for December 1995

LIVE BIRTHS decreased in December as 4,652 Missouri babies were born compared with 5,481 in December 1994. Irregular reporting is the primary reason for this sharp drop.

Cumulative births for the 12 months ending with December show the same rate for 1994 and 1995, 13.8 per 1,000 population.

DEATHS decreased in December as 4,009 Missourians died compared with 4,261 one year earlier. Deaths for the 12 months ending with December show a slight increase in 1995 to 53,869 compared with 53,611 in 1994.

The **NATURAL INCREASE** for the 12 months ending with December was 19,706 (73,575 births minus 53,869 deaths). The rate of natural increase was the same for each of the last two years, 3.7 per 1,000 population.

MARRIAGES decreased slightly in 1995 while **DISSOLUTIONS OF MARRIAGE** increased. The provisional marriage to divorce ratio for 1995 was 1.67, compared with 1.70 in 1994.

INFANT DEATHS decreased in December as well as for the 12 months ending with December. The provisional 1995 infant death rate of 7.5 per 1,000 live births is a record low.

Provisional Resident Vital Statistics for the State of Missouri

<u>Item</u>	December				12 months ending with December								
	<u>Number</u>		<u>Rate*</u>		<u>Number</u>		<u>Rate*</u>						
	<u>1994</u>	<u>1995</u>	<u>1994</u>	<u>1995</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>
Live Births	5,481	4,652	13.0	10.3	76,005	75,146	73,279	73,575	15.2	14.6	14.4	13.8	13.8
Deaths	4,261	4,009	10.2	8.9	50,893	53,655	53,611	53,869	9.8	9.8	10.3	10.1	10.1
Natural increase	1,220	643	2.9	1.4	25,112	21,491	19,668	19,706	4.5	4.2	4.1	3.7	3.7
Marriages	3,238	2,835	7.7	6.3	45,546	44,380	45,070	44,879	8.9	8.8	8.5	8.5	8.4
Dissolutions	2,134	2,629	5.1	5.8	25,926	26,438	26,441	26,844	5.0	5.0	5.1	5.0	5.0
Infant deaths	53	38	9.7	8.2	647	630	597	553	10.2	8.5	8.4	8.1	7.5
Population base (in thousands)	...	...	5,303	5,332	...	...	...	...	5,158	5,191	5,234	5,303	5,332

*Rates for live births, deaths, natural increase, marriages and dissolutions are computed on the number per 1,000 estimated population. The infant death rate is based on the number of infant deaths per 1,000 live births. Rates are adjusted to account for varying lengths of monthly reporting periods.

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Note: This Focus is a condensed version of the article "Exercise, Employment, Other Daily Activities and Adverse Pregnancy Outcomes" published in the February 1, 1996 issue of the American Journal of Epidemiology (143: 211-218).